

treatment, and nomenclature, and is evidently designed for the use of students in manual training high schools. One of the objects, we are told, is to correlate the work of the mathematical classroom with that of the departments of mechanic arts and science. For example, a student is beginning to handle boards in the shop and at the same time is commencing the study of algebra; it is advised that he be assigned some problems on board measure, together with a review of work in fractions. It is, without doubt, advisable to have a general working arrangement between the mathematical classroom and the applied science departments, but the arrangement, in our opinion, may be, and often is, carried too far. There is a danger, if the connection be too intimate, of the student specialising on his own account by giving his earnest attention to those portions of the mathematical work which are adapted to fit the trade he intends following, and giving scant attention to the other portions. It is rarely the case that books of the nature before us succeed in becoming an integral part of an effective educational system, despite the fact that they may be, as this one is, clearly written, full of useful information, and well arranged.

There are a few slips; thus on p. 107 appears an exercise on the work done while punching a hole. It is impossible to work this problem without an autographic record of the operation, although no hint of this is given. Many teachers in trade schools in this country will be glad to inform themselves of American methods through the medium of this book, despite the fact that they may find difficulty in placing it in their pupils' hands owing to the nomenclature, to which reference has been made.

SPECTROSCOPY.

Handbuch der Spectroscopie. By Prof. H. Kayser. Fünfter Band. Pp. vi+853+Täfel ii. (Leipzig: S. Hirzel, 1910.) Price 48 marks.

AS is well known, Prof. Kayser planned to finish his great handbook in four volumes, but owing to the mass of the material dealing with absorption the third volume was divided into two. The same trouble has arisen over the fourth volume on the original scheme, and the present volume contains only the spectra of the elements, arranged in alphabetical order, down to and including nitrogen. The sixth volume, which is to appear shortly, will contain the spectra of the remaining elements, and will conclude the physical spectroscopy.

As Prof. Kayser points out in his introduction, it would have been very satisfactory to include under each individual element a complete account of the work that has been carried out on its spectra under varying conditions of illumination. This would have entailed, however, the expansion of the book by several volumes, and therefore the details that are given have been limited. In the case of the fifty elements dealt with in the present volume, tables of the wave-lengths of the lines in the arc and spark spectra are given, and there also appears an account of the work that has been carried out upon these spectra of each element. Although this has of neces-

sity to be brief, yet Prof. Kayser has dealt with the various investigations in a critical manner. In one or two cases is this especially to be remarked, and the article on the spectra of carbon stands out particularly as a fine critical review of the many contributions to the literature of the subject.

One great difficulty faces anyone who attempts to collate the various measurements of the spectra of substances, and that is the question of the standards upon which these measurements are based. As is well known, for the eight years between 1885 and 1893, the standard generally employed was that of Ångström's map as corrected by Thalén; this was superseded by Rowland's normal solar spectrum, which differed from the previous one in an irregular manner. Later it was shown by Prof. Kayser himself that the coincidence method used by Rowland with his concave gratings is not to be depended upon, and this was borne out by Fabry and Perot, who proved by their celebrated series of interference measurements that the Rowland scale is also irregular in its accuracy. As a result of the discussion held at the meeting of the International Union for Solar Research, a new standard has been set up by Fabry and Buisson, based upon the interferential comparison of a number of equidistant lines with the Michelson cadmium standard. This, however, is too recent to have had very much influence on comparative measurements. As a result of the fact that the three standards are not capable of accurate comparison, it is easy to see that very great accuracy cannot at present be claimed for many of the published spectroscopic measurements. Prof. Kayser remarks that the accuracy cannot be depended upon to within 0.1 tenth-metre.

Another difficulty that is met with in collating emission spectra is the relative intensity of the lines. It is manifest that it is next to impossible to standardise these intensities, for they vary so much with the method of excitation and also with the sensibility curve of the photographic plate. Different experimenters, moreover, have used different scales to which the intensities are referred. The values given therefore can only be taken as a general guide to the brightness of the lines, and cannot be considered of much value in comparing the spectra of different elements.

There is no doubt that this volume is a very worthy follower of the first four in the series, and must prove an indispensable addition to the library of everyone interested in emission spectra. Above all, it shows the directions in which work, and that most important work, still remains to be done. E. C. C. B.

OUR BOOK SHELF.

Subconscious Phenomena. By Hugo Münsterberg, and others. Pp. 141. (London: Rebman, Ltd., n.d.) Price 5s. net.

For the purpose of arriving at some unanimity, if possible, on subjects regarding which there exists a certain amount of diversity of opinion it has recently become the fashion among psychologists to write a *symposium* in which each contributor gives expression to his views. The present work, produced under the editorship of Dr. Morton Prince, is of this nature and

from it we learn what Münsterberg, Ribot, Jastrow, Prince, Janet and Bernard Hart mean by the subconscious. That such a work serves a useful purpose may be gathered from the fact that, as the master of the symposium states in his introduction, there are six recognised meanings of "the subconscious":—

(1) That portion of consciousness which for the moment is outside the field of attention.

(2) Split-off or dissociated ideas, such as automatic writing.

(3) A subliminal, secondary, subconscious "self" constituted and elaborated from such dissociated ideas.

(4) A combination of dissociated and forgotten ideas.

(5) The subliminal reservoir of consciousness from which ideas are drawn into phenomenal consciousness.

(6) Certain neural processes unaccompanied by any mentation whatsoever.

Most of the writers take the view that subconscious phenomena are physiological and not psychological processes, the underlying reason in all being that they are not memories, ideas or anything else of which mentation is composed.

Janet, of course, limits the subconscious to such abnormal states as are encountered in hysteria and psychasthenia, and Bernard Hart considers that the marginal elements of phenomenal consciousness (the *subconscious* of Stout), dissociated portions of phenomenal consciousness (the *co-conscious* of Morton Prince and the *subconscious* of Janet) and the non-phenomenal conceptual *unconscious* of Freud all form part of the material of psychology and not of physiology. It need scarcely be said that a symposium by such writers is above criticism; they criticise each other.

Mikroskopische Untersuchungen über die Übereinstimmung in der Struktur und dem Wachstume der Tiere und Pflanzen. By Dr. T. Schwann. Edited by F. Hunseler. Pp. 242+iv Taf. (Leipzig: W. Engelmann, 1910.) Price 3.60 marks.

At a time when the accumulation of the facts of animal and plant structure threatened to prevent a clear conception of their true value, this famous memoir by a distinguished pupil of Johannes Müller converted histology into a rational branch of science. Schwann, who effected this profound change, based his method on development. He pointed out that "there is a common principle of development for all the elementary parts of the organism," and in so doing founded (with Schleiden) the cell-theory upon which modern physiology and pathology are based. The cellular nature of animals and plants had already been demonstrated, but there was no general hypothesis to "colligate" the facts. This Schwann supplied. He not only confirmed facts of cellular structure, but, in a refreshingly broad way, and moving with the ease of genius amongst a multiplicity of data that would have bewildered a lesser mind, he brought forward the evidence for the origin of the tissues and enunciated clearly his views on the nature of life.

To Schwann the organism is a beehive, as Huxley said in his famous essay on this very treatise. Its activities are the expression of the myriads of cell-changes, each independent of all the rest. To Schwann, and almost against his better judgment, the organism was, indeed, the product of its cells, and its cell the result of the crystallising of a "cytoblastema." Though in some ways we have outgrown this essay, its influence will probably always be felt, and when histology, as to-day, has become incapable of large views from the overburdening load of descriptive data, we realise the need of another Schwann; let us be

thankful for the physiologist who by his developmental hypothesis put the subject-matter into a definite problem and offered a feasible answer.

Determinación de la Latitud por la Observación de Distancias Cenitales de la Estrella Polar. By C. Puente. Pp. 227. (Madrid: Observatorio Astronómico de Madrid, 1910.)

THIS is a monograph on the method of determining the latitude of a place from observations of the zenith distances of Polaris, at a known time. There is nothing new in this method, which proceeds on the ordinary lines of developing the latitude in a series of ascending powers of the polar distance, but the author has put the discussion out with great clearness and considered very carefully the terms that must be taken into account, according to the degree of approximation needed, as well as the most suitable formulæ for use when Polaris is near the upper or lower culmination. The methods of observing by means of the theodolites, the instrumental adjustments, and the precautions necessary to be taken to ensure accuracy are detailed with very great care, the instructions being evidently intended for those who have had little practice. Numerous examples are worked out by different methods, and we have the ordinary curiosity of a latitude determined to the hundredth of a second when the microscopes read only to half seconds, and the time is observed no nearer than a second. Some of the results are so accordant that the ordinary observer must despair of attaining a similar accuracy. The greater portion of the book contains auxiliary tables for accelerating the reduction. Some of these have been extended from Albrecht's "Formeln und Hilfstafeln für geographische Ortsbestimmungen," and are available only within the limits of the Iberian Peninsula.—The more important of the tables include values of $\frac{2 \sin^2 \frac{1}{2} t}{\sin 1''}$, $\log \frac{2 \sin^4 \frac{1}{2} t}{\sin 1''}$, also $\frac{\cos \phi \cos \delta}{\sin (\delta \pm \phi)}$ where t , ϕ , and δ have the ordinary signification.

Calculus Made Easy. Being a very simplest Introduction to those beautiful Methods of Reckoning which are generally called by the terrifying names of the Differential Calculus and the Integral Calculus. By F.R.S. Pp. viii+178. (London: Macmillan and Co., Ltd., 1910.) Price 2s. net.

THE author of this little book writes as if it were the first of its kind, and in encouraging his readers he continually jeers at the professional mathematician in what might be regarded as reckless nursery language. In spite of such faults, we have no doubt that the book will be useful to schoolboys who need the ideas of the calculus in their study of physical science. The young engineer or the clever schoolboy will think it illogical and slipshod to leave $(dx)^2$ out of consideration, as it is inconsiderable in comparison with the other terms of $(x+dx)^2$, and he will say that there is only a pretence in the proof of the differentiation of x^n ; he will probably look upon the introduction of the expansion of $(1+1/n)^n$ when n is indefinitely great, as not quite playing the nursery game.

Einführung in die Biologie. Ein Hilfsbuch für höhere Lehranstalten und für den Selbstunterricht. By Dr. W. Schoenichen. Pp. viii+215. (Leipzig: Quelle and Meyer, 1910.) Price 2.60 marks.

It is difficult to understand to whom this little book is intended to appeal. It might almost be described as a scrap-book of illustrations, borrowed mostly from other text-books, and strung together with a minimum of letterpress. The subject-matter is treated from the point of view of physiology rather than that of comparative anatomy, but there is a short section dealing with cells and tissues, and some extremely